

Speech Based Access of Agricultural Commodity Prices and Weather Information

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Abstract

The mobile and internet revolution has provided solutions to number of different problems, yet farmers in India have not benefit much due to this technological revolution. The reason being lack of knowledge to use internet, smart-phones and illiteracy forces farmers to still follow obsolete and outdated practices. In this paper we are proposing a cloud based system, wherein the illiterate farmers can make a voice call through a toll free number which doesn't even require the Smartphone. The call is automatically answered using a programmable voice interface and expects the farmer to speak in his/her native language Kannada. The farmer can ask about the commodity prices or weather information in Kannada language. The system will automatically answer, process the voice call (Speech processing), translate it into English language (Language translation), fetch the requested information from the cloud/web and reply with latest commodity price and weather information based on the location of the speaker in Kannada language. Further, the efficiency and reliability of the system has been tested.

Keywords: Cloud computing, speech processing, Language translation,

I. Introduction

The mobile and internet revolution has provided solutions to number of different problems, yet farmers in India have not benefit much due to this technological revolution. The reason being lack of knowledge to use internet, smart-phones and illiteracy forces farmers to still follow obsolete and outdated practices. The Indian economy greatly depends on agriculture which adds greatly to the nations GDP. Thus there needs to be a solution to Indian Farmers where farmers can take complete utilization of existing systems and take the advantage of technology assisted farming. The project involves development of a cloud based software system, wherein the illiterate farmers can call the toll free number which doesn't even require the Smartphone. The call is automatically answered using a programmable voice interface and expects the farmer to speak in his/her local language Kannada in this case. The farmer can ask about the commodity prices or weather information in Kannada language. The developed system processes the incoming call, asynchronously connects with google Cloud Engine and storage. The Cloud Speech recognition API calls are made using web services to automatedly fetch the exact commodity price or weather information the farmer is requesting. Once the farmer's speech is recognised the developed cloud system converts the speed to text and connects to the cloud database to fetch the commodity price and weather information through web mining. The commodity price/ weather information is again converted to voice using Programmable voice feature and informed in terms of speech output to the farmers in Kannada. Thus it gives a complete solution for even illiterate farmers in technology assisted farming without using smartphones.

II. Literature Survey

We have made deep literature survey to find the existing systems, their solutions, advantages and limitations. Few attempts have been made to assist farmers using Voice approach of IVR based systems which are provided here.

Reuters Market Light (RML) (Reuters Market Light) (Thomson Reuters: Removing Barriers to Growth in Agriculture, 2011): Reuters Market Light (RML) promoted by Thomson Reuters was initiated in 2006. It provides highly customized and localized agricultural information services via mobile phone based Short Message Service (SMS) primarily for RML subscribed farmers, in 8 local languages[1].

Nokia Life Tools (IBS Center for Management Research, 2009): Nokia Life Tool was launched by Nokia India Private Limited in 2009, in Karnataka, later expanding to provide agricultural information through SMS, to customers in 18 Indian states, covering 11 Indian languages - English, Hindi, Oriya, Gujarati, Bengali, Marathi, Punjabi, Telugu, Tamil, Kannada and Malayalam. The services are subscription oriented, where one pays a monthly fee and some are chargeable on a per download/request basis[2].

Intuit Fasal (Intuit Fasal): Intuit Fasal, started in the year 2009, aims to deliver personalized messages through SMS in the local language to farmers. Currently operational in Gujarat, Andhra Pradesh and Karnataka, the service allows farmers to contact a toll free number and register their profile. Based on this profile, the service attempts to deliver personalized market information to the farmer in an effort to directly connect him/her to a buyer/agent/institution. (A quick point to be made here is that the above-mentioned services use SMS as a medium of information delivery; it remains to be seen how these services will reach out to the largely illiterate or semi-literate farmers.)([3].

IFFCO Kisan Sanchar Limited (Narula, Sikka, Singh, & Chawla, June 2012): Started in the year 2007, IFFCO Kisan Sanchar Limited offers the following services to farmers from 18 states: 5 free voice messages every day on areas of interest to rural subscribers. Messages are prepared by subject matter experts; Content Managers trim it down to one minute lengths; Panel of eminent scientists monitor the quality, Dedicated helpline for query resolution by Experts-Conference Calling available

Avaaj Otalo (Patel, Savani, Klemmer, & Parikh, 2012): This service is designed to target farmers and help them in accessing timely and relevant information related to agriculture over phone. This service kick started with collaboration between Stanford HCI Group, UC Berkeley School of Information, IBM India Research Laboratory and Development Support Center (DSC), an NGO in Gujarat, India. The key features of this service included dialing a phone number and navigating through simple audio prompts. This also had a facility of recording the voice of farmers, browse their menu and get responses of questions and suggestions related to agriculture [4].

mKrishi (mKrishi: A Rural Service Delivery Platform) : mKrishi is a mobile platform, launched in 2009, that allows a farmer to send queries in the form of text, voice or images to the system; the expert will analyses the query based on the farmer profile and the advice/information is delivered to the farmer's mobile. Since then, 12 additional mKrishi pilot projects have been introduced in the Indian states of Punjab, Karnataka, Karnataka, Gujarat, Andhra Pradesh, Karnataka and Rajasthan. Today, mKrishi serves about 10,000 farmers in all markets[5].

ITC's Namma Sandesh (ITC launches interactive mobile telephony for tobacco farmers. This is a new entrant in this industry, which is designed with reference to tobacco and ragi farmers. This interactive mobile telephony based communication offers advisory services as well along with market prices of agriculture equipment's, weather forecast and local news to the farmers. Started with their pilot launch in Mysore, Karnataka the messages were in Kanadda and slowly gathered momentum by diversifying its IVR menu and reaching to a wider audience[6].

From the survey we found that there are some solutions proposed by different researchers but they may not be suitable for Indian farmers as they are illiterate, unable to use internet or smart phone. Hence, we have realized that for Indian farmers it is necessary to develop a system, where they can get the information such as commodity price and weather information through a voice call in their native language such as kannada.

III. Objectives and system description

The main objective of our system is to help farmers stay updated with the latest price of agricultural commodities and weather reports based on the location by dialing a toll free number and enquiring in their native language. The brief objectives as bellow:

- To develop a cloud based system to accept voice call from toll free number.
- To develop a cloud based web application to automatically answer the farmers call and provide him instructions in Kannada language.
- To implement Google Cloud Speech API to recognize commodity price request or weather request made by the farmer using Automated speech recognition
- To develop a software application on cloud which can recognize the request made by farmer using speech recognition, fetch the required commodity price using REST and then convert it back to audio using programmable voice and play it to the farmer in Kannada language

The proposed system consists of development of speech based access to agricultural commodity prices and weather information to Farmers of Karnataka. The farmer places a call to the toll free number. The call is automatically detected and answered by a cloud number. The Programmable voice interface on the cloud asks the farmer to speak. The farmer then asks or commodity price or weather status along with the location. The programmable voice then uses speech recognition API to determine the exact query made by the farmer fetches the information regarding the crops or from the database or Weather API JSON Parsing and reply with requested information through a voice call. Thus this system provides a voice based access to the farmer for commodity prices and weather related information.

The proposed methodology towards the conduct of the project is divided into following stages.

- Android application to help Indian farmers to know the current crop prices using the voice based input. The developed android application can help Indian farmers know the current market prices using the Google Cloud speech API and text to speech. This approach is to help farmers with the problems faced in selling their crops at proper prices and get the best price for their crops in accordance with current price. In addition it is also necessary for the farmer to know the weather. The app also helps farmers with the weather forecast.
- The Cloud Telephony Module: The cloud telephony module consists of setting up of a cloud telephone number to which the Karnataka's Farmer can make a toll free. The Programmable voice interface is also developed in this module task the farmer regarding the query in Kannada language, process the query using cloud services and the respond accordingly to the farmer by providing the information regarding the query: may it be the commodity prices or the weather related information.
- The Google Cloud Speech API:

To recognize the query of the farmer in Kannada language we are using Google Cloud speech API. Once the farmer asks for commodity price in Kannada language, the cloud telephony module Makes API calls to the Google cloud speech API along with the query to perform speech recognition of the query. The google Speech API detects the query and converts it to text accordingly on the cloud.

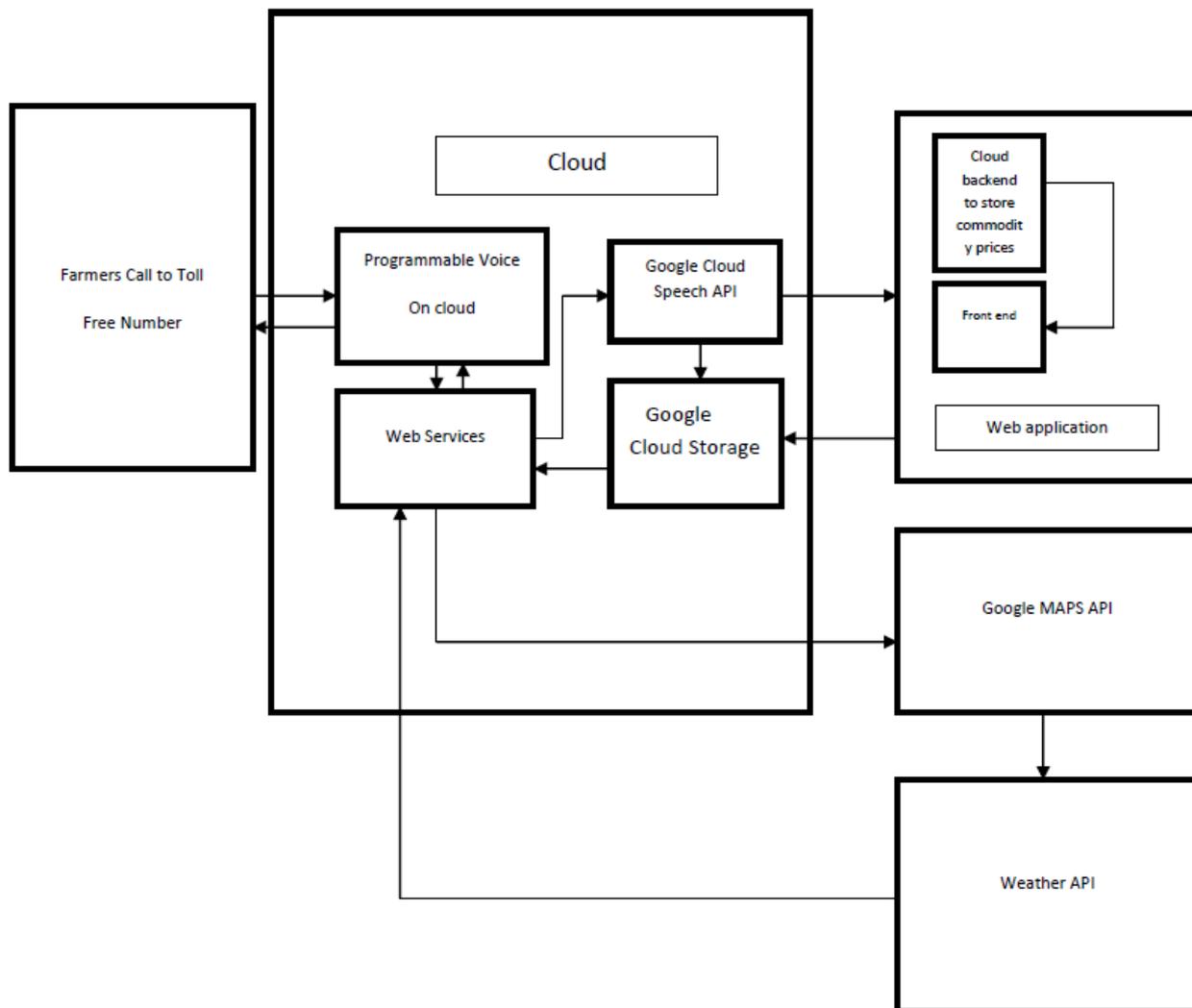


Fig 1. System Architecture

- The Cloud Web application:

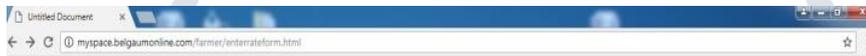
The web application is developed and hosted on cloud storage service. The web application provides the concerned authorities with the necessary software platform to update the commodity prices regularly using the developed front end store it on a cloud database. When the farmer makes the query regarding the commodity prices, the query is converted to text using Google cloud speech API, translated to English using Google cloud translator and checked against the commodities in the cloud database to see the match. This is done using REST web services. If there is a match the cloud backend returns the value of requested commodity price which is again converted to Kannada language speech output using cloud programmable voice interface and informed to the farmer.

- The weather API:

The project also consists of providing the information to the farmer regarding the weather. The weather at respective farmers location can be found out from the weather API by passing the latitude and longitude of the farmer. When the farmers needs to know the weather at his is location the programmable voice prompts the farmer to speak the village name. The lat and long data are fetched from the Google maps API and then the weather is queried. The Output is in JSON string which is then parsed and converted into speech to inform the farmers.

IV. Results and applications

In the result we are having price of the commodities as per location of the farmer in his native language (Fig. 3) and weather information according to farmer location, as shown in the below (Fig. 4). The system has been tested and we found that it is able to automatically detect the call, speech is processed, required keywords are fetched, finally commodity prices and weather information is delivered to farmers through voice call.



| Enter Data: Commodity Price | |
|--|--------------|
| Commodity: | Tomato |
| Latitude : | 16.230816836 |
| Longitude : | 74.6242669 |
| Price : | 35 |
| <input type="button" value="Save Price"/> <input type="button" value="Reset"/> | |

BACK

Fig. 2: Updation of commodity prices on cloud

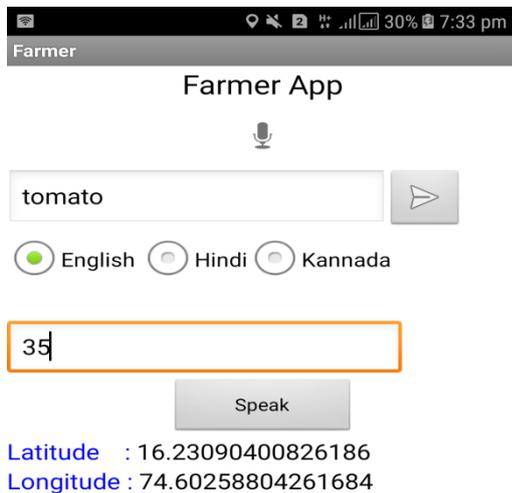


Fig.3: Commodity price information

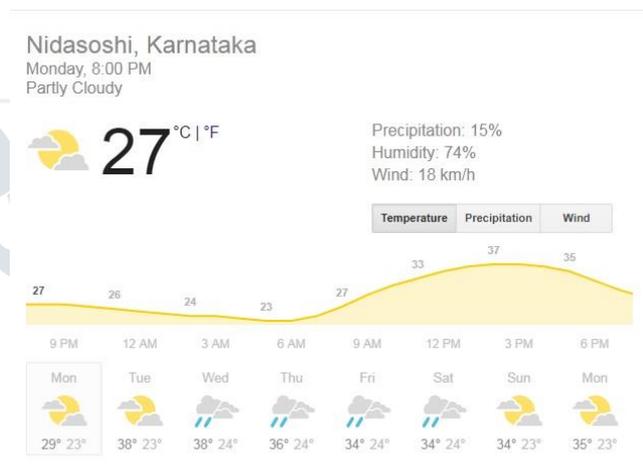


Fig. 4: weather information

The system can be used by illiterate farmers of Karnataka to carry out technology assisted farming by knowing the latest commodity prices as well as weather related Information. It can also be used by Blind farmers for whom it is almost impossible to use smart phones to know the prices and weather just by calling the given toll free number.

V. Conclusion and future work

The mobile and internet revolution has provided solutions to number of different problems, yet farmers in India have not benefited to know the commodity prices and weather information due to illiteracy, lack of using internet and smart phone. Hence we developed a speech based access of agricultural commodity prices and weather information system, where formers make a phone call through toll free number and enquire commodity price, weather information in Kannada language. The system will automatically answer, process the voice call (Speech processing), translate it into English language (Language translation), fetch the requested information from the cloud/web and reply with latest commodity price and weather information based on the location of the speaker in Kannada language.

The future work is to develop a consortium to support formers across Indians with support of all Indian languages.

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